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ABSTRACT

This pamphlet addresses the research related to underachievement of women in science and mathematics and the implications of such underachievement for the nation. Fewer women are graduating in science and engineering and girls continue to score lower than boys on science achievement tests. The brochure stresses that an equitable education makes a difference in achievement and suggest guidelines for assessing equity in the classroom. Sections of the pamphlet include: (1) "Why Bother?"; (2) "Are Girls Receiving as Good an Education as Boys?"; (3) "Are Single-Sex Classes the Answer?"; (4) "What is an Equitable Coed Classroom?" and (5) "Is My Class Equitable?" A 9-item reference and sources section concludes the pamphlet. (EH)

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Why Me? Why My Classroom?

Equity in Coed Math and Science Classes

ED 409 247

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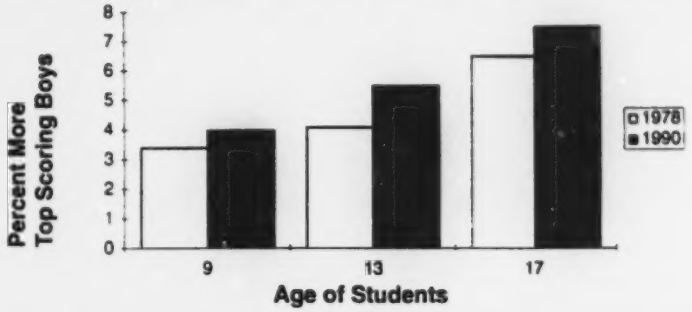
Why Bother?

Because inequity in math and science classes causes serious problems for individual students and for us as a country.

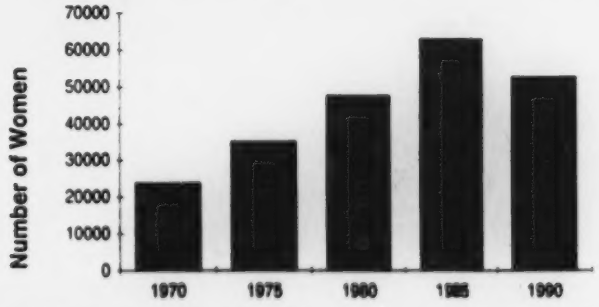
While overall gender differences in science achievement are decreasing, the gap between high-achieving girls and boys is increasing, with boys doing better. National Assessment of Educational Progress data indicates that between 1978 and 1990, 4.1 percent more 8th grade boys than girls were "top scoring" while by 1990 that percentage had increased to 5.5 percent!

The Increasing Science Achievement Gender Gap



Also, after years of increases, the National Science Foundation found that fewer women are now graduating in science and engineering.

Women Graduating in Science and Engineering



Today most working women are employed in a small number of generally low-paying, nonmath-related jobs and careers.

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Why Bother?

Because an equitable education makes a difference.

Teachers Count

Believe it or not, teachers really are important influences in students' lives. In 1987, Campbell and Metz studied female engineering students and found that math and science teachers, along with parents, were the girls' most effective encouragers.

Furthermore, studies like those of Werner (1989) have found that the students who overcome what the research calls "devastated backgrounds" tend to have one thing in common—a caring adult outside of the family who is "on their side." Most frequently that adult is a teacher.

Teachers make a lifelong difference. Your encouragement counts a great deal.

Classroom Environment Counts

Classroom environment makes a difference as well. A positive classroom climate, supportive students, diverse role models, and even the right pictures on the walls in the room can help to keep girls (and boys) in math and science courses.

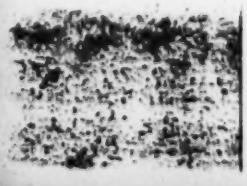
Research summarized in the *AAUW Report: How Schools Shortchange Girls* found

- Girls are more successful in classes in which there is fairness and equitable treatment.
- Girls who see math as what girls and boys do are more apt to go on in math and do better in it than are girls who see math as a "boy thing."
- Getting more girls into advanced math and science classes makes a difference. When there are only a small number of girls, girls report feeling more intimidated and less comfortable. Close to equal numbers of girls and boys means increased confidence for many girls and reinforces that math and science are for girls as well as boys.

Math Education Counts

More math courses means more money. In 1991, Adelman found that women and men who had taken at least eight credits of math in college (usually calculus) made more money than those who did not.

While women usually make less money than men in the same jobs, in some math-related jobs like computer programming and electrical engineering, women in their thirties actually earn more money than men!



Are Girls Receiving as Good an Education as Boys?

Most teachers really believe "I treat all my kids equally." But most teachers are wrong. Teachers, both female and male, tend to treat girls and boys quite differently. Research summarized in the *AAUW Report: How Schools Shortchange Girls*, found

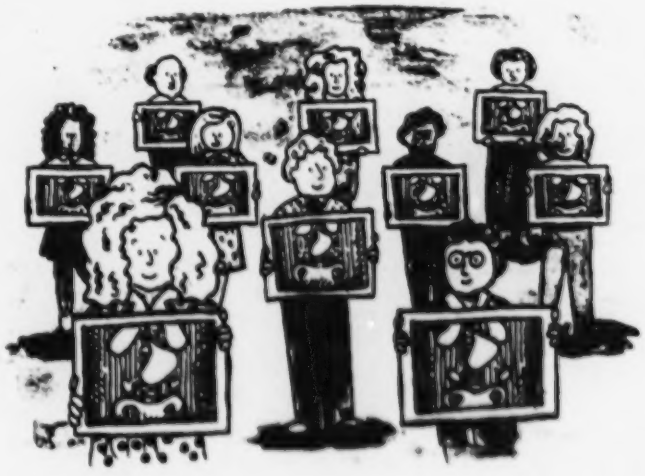
- Teachers initiate more interactions, both positive and negative, with boys than with girls.
- Boys initiate more interactions with teachers than do girls, so teachers respond more to boys than to girls.
- In most classes a few students (almost always boys) dominate the classroom. Many boys and almost all girls receive little or no teacher attention.
- Teachers respond differently to boys' and girls' requests for help, being more apt to coach boys to get the answer themselves while giving girls the answer directly.
- Teachers are more apt to criticize boys for the academic quality of their work and to praise girls for the appearance of their work.
- Boys are more apt to participate in extracurricular math, science, and computer activities.

Even today in most junior high and high schools there is still at least one teacher who

- feels girls aren't good in math and science
- doesn't particularly want to teach girls
- makes the girls feel they are "inferior outsiders"

Students and other teachers know who those teachers are and often are distressed about them, but rarely do anything.

Perceptions remain that math and science are male domains. As a result, while high school gender differences in math and science achievement are small, differences in college majors and job selections are great. Education is giving girls the message that math and science should not be a part of their future.



Are Single-Sex Classes the Answer?

Almost all U.S. students are in coed classes and will remain there. Single-sex classes are not the "answer" to inequity.

Single-sex classes have grown out of a feeling that girls can't concentrate or get the teacher's attention because there are so many rowdy boys. It is also felt that girls are "embarrassed, intimidated, distracted, and ignored in coed math classes." The "obvious" answer for some is to segregate the girls and the boys. However, by removing girls, rather than dealing with real issues of classroom discipline and respect, we give the inappropriate educational messages that

- the acceptable standard of classroom behavior is defined by the most aggressive boys
- appropriate "girl behavior" is to be passive and that the appropriate female response to male aggression is not to fight back or go to authority but to withdraw

Single-sex classes also reinforce the stereotypes that

- girls are gentle, weak creatures who can't handle the rough environment of the real world
- boys are incorrigible

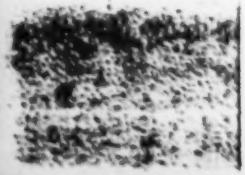
These are stereotypes. Not all girls are passive and not all boys are aggressive. Some girls and boys learn better in cooperative, low-key environments; others do better in more competitive, quickly paced environments. Neither girls nor boys learn well in disruptive environments in which their efforts are ridiculed. We need to look at the individual student's needs, and not act on gender-stereotyped assumptions.

Girls and boys just aren't that different. Just knowing someone is a girl or a boy tells you nothing about their math and science skills. It doesn't even tell you very much about their language skills or aggressiveness.

To some degree the issue of single-sex math and science classes in coed schools is moot. According to the U.S. Department of Education

> *Any classroom assignment of students on the basis of sex, even if voluntary on the part of the participants, that is not an exception allowed by the regulation [human sexuality classes, contact sports, and voluntary separate assignment for pregnant girls] is a violation of Title IX.*

The answer is to have equitable coed classes.



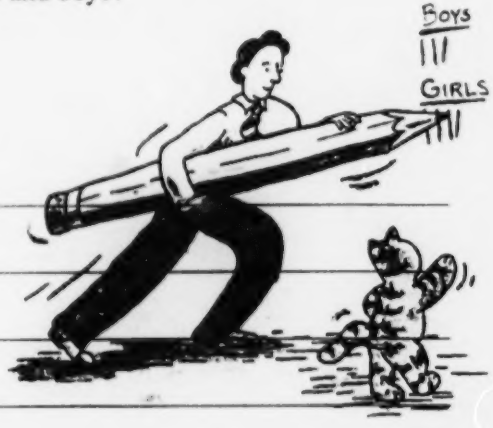
What Is an Equitable Coed Classroom?

There are many definitions of "equity" and even more definitions of an "equitable classroom." Each of us needs to develop our own definition of an equitable classroom. Definitions may include the following concepts:

- The teacher is in charge of the classroom and no one student is allowed to dominate.
- All students—girls as well as boys, students of color as well as white, shy as well as assertive, quiet as well as loud—speak up in class regularly.
- No student is allowed to put down or pick on another student.
- Praise is based on achievement.
- Both girls and boys, or neither girls nor boys, are praised for personal appearance or neatness of work.
- All students experience leadership roles.
- All students actually do labs and other hands-on activities.
- The contributions of female and male scientists and mathematicians from different ethnic groups are part of the curriculum.
- Stereotypes about who does and who doesn't do science and math are directly confronted.

Think about your own classroom and others you've seen. What should a classroom be like that is fair to and encourages both girls and boys?

Now write your own definition.



An equitable classroom is

Is My Class Equitable?

Unless you've evaluated your classroom, it is nearly impossible for you to know if it is equitable. Evaluation isn't hard to do—start by following these steps.

1. **Reflect and Write Down.**
   How do you feel you treat girls and boys in your classes? Are there things you do that you would like to change? Are there things you want to be sure that you do?

   Sometimes our behaviors and beliefs are not obvious, even to us. For example, think about how you would describe your best female students, then your best male students. How are the descriptions similar? How are they different? Do you have similar or different expectations for girls and boys?

2. **Observe.**
   Consider using one or more of the following alternatives to see what's happening in your classes:

   - **Videotaping**
     Set up a video camera. Choose a spot that is unobtrusive but records as much of the classroom as possible (a corner works well). It may feel a bit strange at first, but you and the students will quickly get used to it.
   - **Adult or Student Observation**
     Ask an adult or one or more students to observe your classroom. Think about what you want to know and explain to them what you are interested in having them check. They can, for example,
     - count the number of girls and boys you call on, the number of boys and girls who call out, and your responses to them
     - note who is asked simple fact questions and who is asked more complex interpretive questions and check who is asked to support their answers
     - track which students are praised and for what (e.g., appearance, appearance of work, quality of work, quietness)

     From these questions develop simple "data collection sheets" with tally and notation areas for your observers to use. Remembering that novice observers can only check one or two areas at a time, ask them to record their impressions.

3. **Make Sense of Your Data.**
   View the tape, tally the counts, check the impressions. Are you satisfied with what you found? If not, and most teachers aren't, consider things you can change, including calling on different students, making rules about students who put down other students, or changing the ways you discipline students.

4. **Collect Data Periodically.**
   See if you are changing in ways you want.

5. **Make Changes.**
   Use the data!

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Other brochures in this series
"Girls Are . . . Boys Are . . . : Myths, Stereotypes and Gender Differences"
"Teacher Strategies That Work for Girls and Boys"
"Whose Responsibility Is It? The Role of Administrators and Counselors"

Illustrations by Judy Butler

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